Regional Health Information Networks: The Wisconsin Health Information Network, A Case Study

Kim R. Pemble, M.S.
Wisconsin Health Information Network

ABSTRACT

It is projected that by the turn of the century, ninety percent of diagnostic procedures and seventy percent of therapeutic procedures will occur outside a hospital setting [2,3]. Additionally, according to a 1992 study by Arthur D. Little, during any given physician office visit, as much as 30 percent of the required diagnostic data and information required by the physician is unavailable [4]. Driven by ever increasing demands for convenience and accessibility, health care continues to evolve into an environment where the importance of data and its relative availability to the requester are diverging. This paper will present the concept of a regional or community health information network (RHIN or CHIN). Specifically, the Wisconsin Health Information Network (WHIN) will be used as a case study.

PROBLEM/CHALLENGE

During the life of a patient, his or her movement through the "continuum of care" exacerbates the relative inaccessibility of information to the wide base of providers and other legitimate authorized viewers. This "continuum" includes primary care physicians, specialists, clinics, hospitals, reference laboratories and diagnostic centers. During a visit with any given provider, there is a need for current, complete and accurate information regarding the patient. Yet, according to an Arthur D. Little study, 30% of the diagnostic data (e.g. lab results, consults, patient history) are unavailable to the care provider during that office visit.[4]

Recent advances in implementation of integrated systems and computer based patient records is improving the data availability within a given institution, however the "continuum" of care is not constrained to a given hospital or integrated delivery system (Figure 1). There remains a growing need for access to patient clinical and demographic data for care providers and other authorized medical information users (e.g. payors, employers, laboratories, health care consortiums) within a community or region.

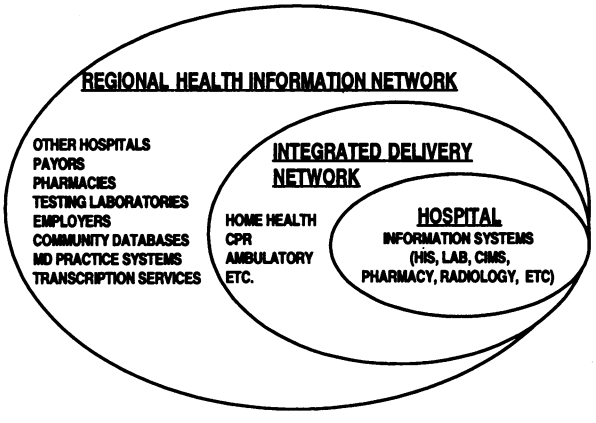

FIGURE 1

Examples of the data involved in this communications quagmire include:

- Patient Identification
- Patient Demographics
- Referral Requests
- Laboratory Results
- Transcribed Documents (e.g. Laboratory, Radiology, Surgical, History and Physical)
- Medical Records Abstracts
- Graphic Images (e.g. ECG, Pulmonary Function Tests)
- Radiographic Images
- Claims
- Eligibility Verifications
- State Required Testing Results and Other Community Databases

In the current paradigm (Figure 2), access to this data is gained through countless phone calls, proprietary networks to selected components of the community structure, the U.S. Postal Service and couriers. The advent of a Regional Health Information Network provides access through a means that incorporates a common "look and feel" to a broad spectrum of

0195-4210/94/$5.00

applications, regardless of originating host system(s) or application software. This access is through dial connections to a system serving as a switch (routing transactions) which is integrated with various medical information providers' systems (Figure 3).

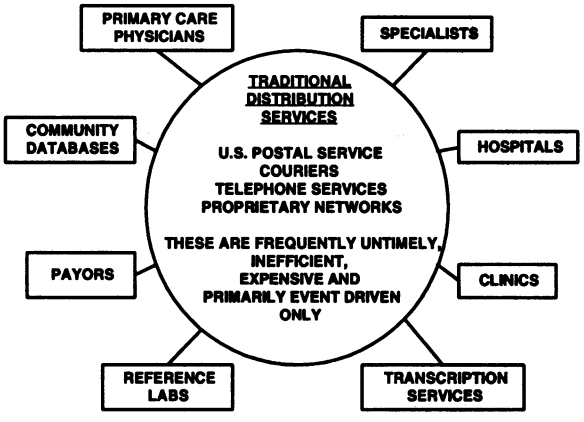

FIGURE 2

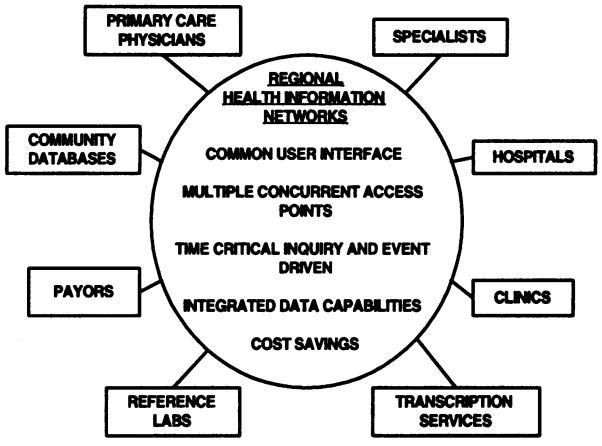

FIGURE 3

REGIONAL HEALTH INFORMATION NETWORKS

There are three components to the Wisconsin Health Information Network (WHIN): Information User Interface (e.g. physicians, physician office staff, hospital departments, clinics, pharmacies, laboratories), The Network Switch and the Information Provider Interface (e.g. hospitals, clinics, laboratories, pharmaceutical services, library services, transcription services, HIS, Laboratory Systems, Transcription Systems etc.). (Figure 4)

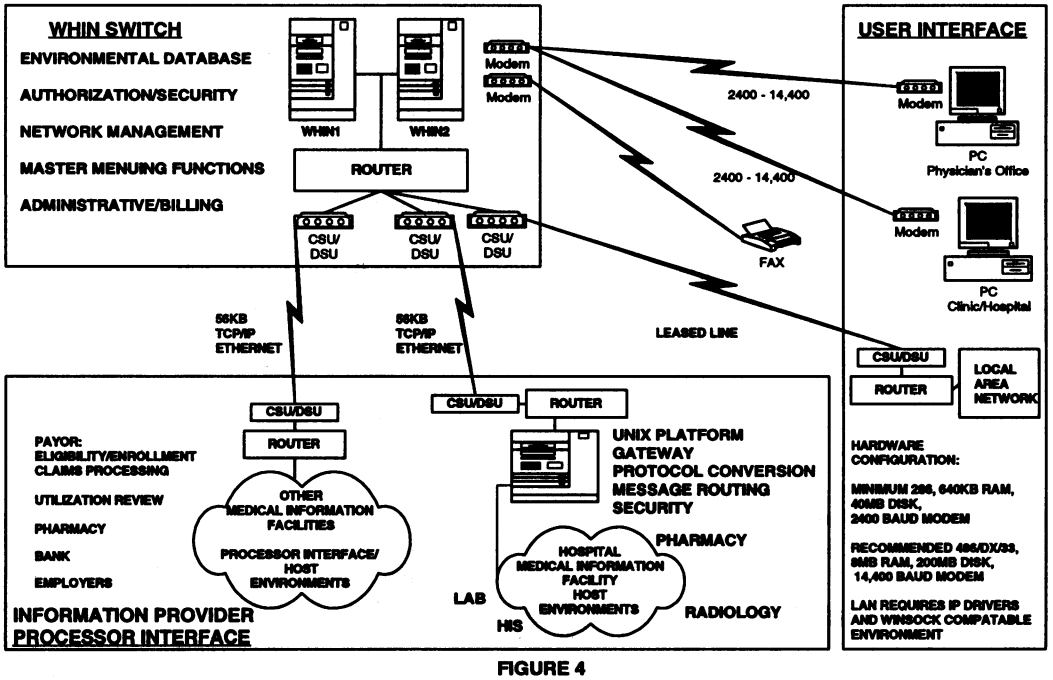

FIGURE 4

Information Provider Interface

Integrating the systems environment of a medical information provider, while maintaining the provider's investment in application hardware and software, is the role of the Processor Interface (PI). Functioning as an interface engine, the PI establishes the bridge between any system/protocol that is to provide information to the network and the network protocol. Interfaces may be established in a peer-to-peer manner, by direct SQL access to databases, or by "scraping" data from application screens. To date, interfaces have been developed to IBM mainframes, DEC/VAX and Hewlett Packard platforms. Network protocols that have been interfaced include SNA/3270, LU6.2, DECNET, and TCP/IP.

Location of the PI may be either at the WHIN site, executing on the WHIN hardware or, depending on the environment, at the medical information provider site executing on client provided, WHIN specified hardware. Connections from the medical information providers to the network are typically 56KB leased lines (point to point) or through frame relay services. As band width requirements rise, ISDN, T1 or greater connections can be implemented.

The interfaces are designed to support request/response communications, initiated by an information user, as well as "event-driven" processing, which are transactions initiated by a host system.

Network Switch

Providing the server side of a client/server relationship, the switch runs on a redundant SUN SPARC UNIX platform, utilizing TCP/IP and HL/7 protocols. The switch maintains all network user authorization and authentication information as well as managing all routing functions for the network. In addition to request/response and event-driven processing, the switch also provides electronic mail services, outbound fax service and deferred request processing. During the period January 1, 1994 through July 31, 1994, a total of 19,724 calls were received by the network, processing clinical and claims transactions. 73.3% of transactions were clinical and 26.7% financial.

Information User Interface

Utilizing a common user interface, information users may access data from medical information providers that have authorized this access. The common user interface (UI) is currently based on a DOS, Microsoft Windows or Novell platform. This interface provides the client element of the relationship with the network switch.

With the common user interface, patient demographics from Hospital A and Hospital B are accessed through the same means and displayed in the same manner. Data components that may not be supported in one environment may be indicated as 'not provided'. Similarly, laboratory results are accessed in one consistent manner, although results display may vary, depending on such parameters as normal ranges and test code groupings.

By providing a common access point to a wide range of medical information providers, this UI and the network to which it connects replaces the proprietary network connections and printers typically found in a physician office setting. Connection to the network is the only physical login the user is required to supply. All other host logins are managed at the software level.

Access to WHIN from the user interface is accomplished through a dial connection. Speeds from 2400 baud to 14.4 baud are currently supported. Again, as requirements dictate, additional bandwidth through V. Fast and ISDN connections is available. There are also UNIX and Network versions of the User Interface.

Information Flow

There are two models for the flow of data/information on the network, the primary method is a request/response structure and the second is 'event driven'. Using request response, users connect to the network and send requests for information regarding patients to medical information providers. Security surrounding the ability to make these requests is outlined in the following section.

In the 'event-driven' model, the medical information provider systems are the initiators of the data flow. Messages are routed through the network to the indicated recipient(s) and filed in an electronic mailbox until they are read by the user. These messages may also be delivered via network outbound fax capabilities. Confirmation of delivery is returned to the indicated initiator through the e-mail service which is a part of the network. These event-driven messages are viewed in the same manner as the on-line request response messages.

SECURITY

Although a detailed discussion of the security implemented at WHIN would require a separate paper, the following is presented as a high level overview of some security points.

Access to the network switch is gained through a user ID and password. The phone number dialed is managed by the software and hidden from the user. All traffic on the dial connection is encrypted and requires a copy of the User Interface to break. Additionally, access to the network requires the UI software and authenticating serial number assigned to each copy during installation.

Authorization from a medical information provider is required for any user to submit requests to, or receive messages from, that host environment. Access and viewing capabilities may be granted on a medical information provider, system or data element level. In addition to the security of the network, all security developed at the medical information provider system is supported and maintained through the processor interface.

No data is stored on the WHIN switch, other than as an element of an electronic mail message, an event driven message or deferred response waiting to be read. Once deferred or event driven messages are read, or reach an age of 30 days, they are purged.

WISCONSIN HEALTH INFORMATION NETWORK: STATUS REPORT

As of August 1, 1994, there are eleven (11) hospitals or medical centers (Children's Hospital of Wisconsin, Community Memorial Hospital, Froedtert Memorial Lutheran Hospital, Sheboygan Memorial Medical Center, St. Luke's Medical Center, Sinai Samaritan Medical Center, St. Mary's Hospital, St. Mary's Ozaukee, Trinity Memorial Hospital, Valley View Medical Center and Wausau Hospital) signed on the network (six of these are live with the remainder in various stages of PI development), three (3) payors (one in pilot testing), one nursing home and two ambulance companies. Over 1000 physicians, authorized physician office staff members and hospital departmental staff are subscribers to the network. It should be noted that several of the mentioned medical centers and hospitals are competitive entities participating on the same network.

Monthly transaction volumes average in excess of 40,000 from more than 3,100 calls to the network. Response time, although very dependent on the performance of host systems providing responses to requests, averages 3-7 seconds. Current functions available include patient demographics, transcribed documents, laboratory results, pharmacy orders, medical records abstracting, electronic mail, outbound fax, electronic claims submission, patient search and patient census by physician. Distribution of data requests by type, most frequent first, is:

Clinical:

- Patient Search
- Patient Visit and Insurance Information
- Transcription Data
- Patient Census
- Medical Procedures/Episodes
- Laboratory Results
- Physician List

One of the WHIN medical information provider participants had previously implemented a proprietary network for physicians to access their host based systems. WHIN was implemented as a replacement for this proprietary network. During a three month period in 1993, a study group of 24 physicians was monitored to compare their usage of WHIN to the same group's previous use of the proprietary network during the same three month period in 1992. Data services that were monitored for the study were available from both networks.

First quarter 1992 total requests to proprietary network 3,189

First quarter 1993 total requests to WHIN network 11,274

The study showed WHIN usage had a two hundred fifty four percent (254%) increase over the proprietary network. Even allowing for fluctuations in patient volumes, this appears to demonstrate the added value that WHIN brings to this physician population.

Additionally, WHIN offers other services than those included in this study (e.g. E-mail, electronic claims submission, claims status and eligibility inquiry).

In addition to community participation, ownership in the Wisconsin Health Information Network is open to health care related entities in the State. WHIN

currently employs 16 full time staff, including installation/training/Solution Center (Help Desk), technical development/network management and sales/marketing.

BENEFITS

According to a 1992 study [4], there is potential for an annual savings of more than 30 Billion dollars by providing physicians and other authorized users telecommunications access to patient information.

Areas where benefits are projected:

Hospital:

- reduction in calls to medical information providers requesting information
- savings from developing proprietary networks including hardware, software, support staff, help desk, training
- reduction in repeated tests
- improved public image due to anticipation and preparation for preadmitted patient arrivals
- reduction in postage, courier costs and staff time to distribute results
- electronic eligibility verification

Physician:

- improved access to critical patient clinical data
- electronic eligibility verification
- electronic claims submission and tracking
- electronic explanation of benefits
- reduced pre-authorization time
- reduced telephone tag with pharmacies for filling and refilling prescriptions
- reduced staff time in obtaining results and other patient information
- improved communications with hospitals and colleagues

A detailed cost benefit study of WHIN is projected in the near future. Until that time, we can only relay the subjective feedback regarding benefits realized from WHIN's clients:

> "The biggest benefit is the cost savings", said Dr. Richard J. Battiola, saying that the network has cut down immensely on ordering multiple tests for patients. [6]

> "Networks like this are very important in reducing our medical costs," says the supervisor of the administrative office for Dr. Joseph Shaker. [7]

The author wishes to thank his colleagues at WHIN and all the clients of the Wisconsin Health Information Network for their assistance in making WHIN a success, allowing the writing of this paper.

REFERENCES

1) Steinman, Jack, "An Extended Enterprise Computing Solution: Wisconsin Health Information Network", Proceedings of the Thirteenth Annual Conference on the Use of Clinical Information Systems, March 14, 1993, pages 35-36.

2) Gabler, James M., "Shared Information Boosts Competition in Healthcare Networks", Computers in Healthcare, March 1993, pages 20-26.

3) Zinn, "Enabling Technologies Build Bridge to 21st Century", Computers in Healthcare, December 1992, pages 28-33.

4) Little, Arthur D., "Telecommunications: Can It Help Solve America's Health Care Problems?", July 1992, reference 91810-98.

5) Singer, Charles F., "The Singer Report on Managed Care Systems and Technology", report number 21, April 4, 1994.

6) Stewart, Janet Kidd, "Doctor Likes Medical Info Network", Chicago Sun-Times, November 18, 1993 page 56.

7) Sharma-Jensen, Geeta, "On line: Ameritech looks into the future", The Journal (Milwaukee), February 1, 1994 pages 1 and 7.